MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

BEF3014 –ECONOMETRICS MODELLING AND FORECASTING

(All sections / Groups)

13 MARCH 2019
9.00 a.m. - 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR (4)** questions on **SIX (6)** printed pages.
2. Attempt **ALL** questions. The distribution of the marks for each question is given.
3. Write all your answers in the answer booklet provided.
4. Formula sheet is attached to the back of this question paper.

QUESTION 1

Table 1 below presents the data of Malaysian population growth from 2010 to 2015.

Table 1

Year	Population growth (annual %)
2010	1.6
2011	1.6
2012	1.6
2013	1.5
2014	1.5
2015	1.4

Source: Data are obtained from World Bank, www.databank.worldbank.org.

(a) Based on the data above, forecast the population growth from 2010 to 2015 using the following forecasting method (assume $\alpha = 0.6$, $\beta = 0.4$) and initial value of 1.6:
[*Hint: Please ensure that all the computations are accurate to **three decimal places***]

(i) Simple exponential smoothing (3 marks)

(ii) Linear exponential smoothing (9 marks)

(b) Compute MAE and RMSE for each forecasting method. (9 marks)

(c) Based on part (b), suggest and explain which forecasting method performs better. Generate one-step-ahead forecast for the population growth of 2016 using your suggested method. (4 marks)

[Total: 25 marks]

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QUESTION 2

Table 2 presents the hypothetical time series data of sales revenue (RM million) for Company XYZ.

Table 2

Time	t	Sales [Y]	MA(4)	CM(4)	Detrended series
2015Q1	1	115	---	---	---
2015Q2	2	90	---	---	---
2015Q3	3	65			
2015Q4	4	135			
2016Q1	5	130			
2016Q2	6	95			
2016Q3	7	75			
2016Q4	8	150			
2017Q1	9	135			
2017Q2	10	105			
2017Q3	11	85	---	---	---
2017Q4	12	155	---	---	---

Seasonal calculations

Quarter	2015	2016	2017	Seasonal means	Adjusted means
Q1	---				
Q2	---				
Q3			---		
Q4			---		
			Total		4.000

Normalising factor = _____

Continued...

(a) Use classical multiplicative decomposition method to calculate the detrended series and quarterly seasonal indices. (22 marks)

[*Hint: Students are required to reproduce Table 2 in the answer booklet. All the computations are to be rounded up to* ***three decimal places***]

(b) Assuming the trend in the data is $T_t = 95.7266 + 2.4018t$, where t =1 is 2015Q1 and t = 12 is 2017Q4. Prepare the company's quarterly sales revenue forecast for 2018 Q1. (3 marks)

[Total: 25 marks]

QUESTION 3

Consider the following multiple regression model for a sample of 209 firms in Country XYZ for 2018:

$$Salary_i = \beta_0 + \beta_1 Sales_i + \beta_2 roe_i + \beta_3 ros_i + \varepsilon_i$$

Salary	:	Salary of CEO (RM'000)
Sales	:	Annual firm sales (RM'000)
roe	:	Return on equity (%)
ros	:	Return on firm's stock (%)

The results are reported in **Table 3.**

Table 3

Estimated sample firms: 209

Variable	Coefficient	Standard error	t-statistics	Probability
Constant	75.189	5.569	13.501	0.000
Sales	1.323	0.165	8.018	0.000
roe	1.018	0.226	4.504	0.003
ros	1.001	0.112	8.938	0.000

R-squared = 0.387
F-statistic = 43.140 [0.000]
Jarque-Bera test = 5.865 [0.258]
Serial correlation LM test = 24.769 [0.000]
White test = 93.658 [0.000]

Correlation Matrix

	Sales	*roe*	*ros*
Sales	1	---	---
roe	0.896	1	---
ros	0.987	0.956	1

Continued...

Based on **Table 3**, answer the following questions:

(a) Do all the explanatory variables significantly explain the salary of CEO? Explain using F-test at $\alpha = 5\%$. (5 marks)

(b) Calculate and interpret the elasticity of CEO's salary with respect to the annual firm sales, given that the salary of CEO (RM'000) is 150 and annual firm sales (RM'000) are 850. (6 marks)

(c) Has the estimated multiple regression model met the assumptions underlying the method of Ordinary Least Square (OLS)? Explain your answer based on $\alpha = 5\%$. (8 marks)

(d) Generate a 95% prediction interval for the salary of a CEO in a company, given *Sales* = 500, *roe* = 11.82, *ros* = 5.35, and the estimated standard error = 0.864. (4 marks)

(e) Is the forecast likely to be accurate? Explain based on part (c). (2 marks)

[Total marks: 25 marks]

QUESTION 4

(a) Define the following terms:

(i) Leptokurtosis (2 marks)

(ii) Volatility clustering (2 marks)

(iii) Leverage effects (2 marks)

(iv) An integrated time series (2 marks)

(v) Cointegration (2 marks)

(b) Suppose that given the data on SP (share price), you want to fit a suitable ARIMA model for a short-term forecast on these data.

Outline the **FOUR (4)** steps involved in carrying out this task. (6 marks)

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(c) "Although the Vector Autoregressive (VAR) approach is simple in the sense that one does not have to worry about determining which variables are endogenous and which ones are exogenous, there are some problems with VAR modelling."

Discuss any **THREE (3)** problems of VAR modelling. (9 marks)

[Total marks: 25 marks]

End of Questions

Formula Sheet

Simple exponential smoothing (SES):

$$\hat{Y}_{t+1} = \alpha Y_t + (1-\alpha)\hat{Y}_t$$

Linear exponential smoothing (LES):

$$L_t = \alpha Y_t + (1-\alpha)(L_{t-1} + T_{t-1})$$

$$T_t = \beta(L_t - L_{t-1}) + (1-\beta)T_{t-1}$$

$$\hat{Y}_{t+p} = L_t + pT_t$$

Mean Absolute Error (MAE) $= \frac{1}{n}\sum_{i=1}^{n}|Y_{t+i} - F_{t+i}|$

Mean Square Error (MSE) $= \frac{1}{n}\sum_{i=1}^{n}(Y_{t+i} - F_{t+i})^2$

Root Mean Square Error (RMSE) $= \sqrt{MSE}$

$Elasticity = b_1\left(\frac{X}{Y}\right)$

Prediction interval = $F_{t+1} \pm (t_{\alpha/2,n-K-1}) * SE$

Summary of *t*-distribution:

df \ Pr	**0.05** **0.10**	**0.025** **0.05**	**0.005** **0.010**
40	1.684	2.021	2.704
60	1.671	2.000	2.660
120	1.658	1.890	2.617
∞	1.645	1.960	2.576

End of Paper